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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,641	11/05/2002	Stephane Renou	040849-0207	5971

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EXAMINER	
FERRIS III, FRED O	

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 05/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/065,641	RENOU ET AL.	
	Examiner	Art Unit	
	Fred Ferris	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,18-33,35 and 36* is/are rejected.

7)☒ Claim(s) *17 and 34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 November 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-36 have been presented for reconsideration based on applicant's arguments filed on 21 February 2006. Claims 1-6, 18-33, 35, and 36 remain rejected by the examiner. Claims 17 and 34 are objected to.

Response to Arguments

2. Applicant's arguments filed 21 February 2006 have been fully considered but they are not persuasive.

The main thrust of applicant's arguments centers around asserting that the prior art does not teach an optimizer/controller capable of co-coordinating the functions of optimization and control in a gas engine, or a dynamic optimizer/controller that dynamically optimizes and controls operation of a gas turbine using model based control. In response the examiner first submits that a review of applicant's specification for guidance on the meaning of the term "model based control", reveals that that the claimed term actually makes use of model predictive control (MPC) (para:0043, lines 1-5). Model predictive control (MPC) or model based predictive control is a well-known technique, see for example Perry's Chemical Engineers' Handbook, 7th Edition, page 8-25. A key feature of model predictive control is that future process behavior is predicted using a model and available measurements of the controlled variables. The controller outputs are calculated so as to optimize a performance index, which is a linear or quadratic function of the predicted errors and calculated future control moves. Hence a skilled artisan would have knowingly implemented the claimed "model based control"

using model predictive control (MPC) to realize the claimed features relating to optimization and control in a gas turbine engine. Further, the claimed "objective function" simply defines the operation and control constraints (specification: para:0016), both of which are taught in the prior art as noted below. (See: Hacker: Abstract, Section 3, Fig. 4 Bankert: CL3-L31 – CL5-L43, CL4-L14-16, Figs. 1, 2, for example) The prior art also clearly discloses "models" inclusive of "objective functions". (See: Bankert, CL4-L14-16, or Hacker, Abstract, Section 3, Fig. 4, for example)

Applicant's arguments relating to the assertion that the claimed invention is novel over the prior art because it "targets integrating the design for the operations and the controls for a gas turbine", is not persuasive since there do not appear to be any claim limitations that specifically require the invention to "target" the operation and controls while "integrating the design". Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In this case applicants arguments are clearly more specific than the claims require. Accordingly, the examiner maintains the 103(a) rejection of claims 1, 5, 6, 9, 10, 12-16, 20-22, 24, 25, 28-32, and 35.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 5, 6, 9, 10, 12-16, 20-22, 24, 25, 28-32, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Robust design through the use of a hybrid genetic algorithm", Hacker et al, Proceedings of DETC'02, DETC2002/DAC-34108 or US Patent 5,633,800 issued to Bankert et al in view of US Patent Application Publication 2002/0123870 issued to Chan et al or "Improving the Aircraft Design Process Using Web-based Modeling and Simulation", Reed et al, ACM Transactions of Modeling and Computer Simulation, Vol. 10, No. 1 January 2000.

Independent claims 1, 22, and 35 are drawn to:

Method, system, and program code for designing operations/controls of gas turbine by:
- generating gas turbine operations model by objective function
- defining operations/control constraints for model of gas turbine
- providing online optimizer/controller dynamically optimizing/controlling operation of gas turbine using model based control that is based on operations model and operations/control constraints.

Regarding independent claims 1, 22, and 35: Hacker and Bankert both teach gas turbine operation and control optimization inclusive of generating a gas turbine model

with at least one objective function (Hacker: Abstract, Section 3, Fig. 4, Bankert: CI3-L31-CL4-L44) and defining the operations and control constraints (Hacker: Abstract, Section 3, Fig. 4 Bankert: CL3-L31 – CL5-L43, CL4-L14-16, Figs. 1, 2).

Hacker and Bankert do not explicitly teach dynamically optimizing the gas turbine model online (i.e. over the Internet).

Chan and Reed both teach the dynamic optimization of turbine design in an online environment (Chan: para:0030, Fig. 5, Reed: Section 3, Figs. 3, 4).

It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Hacker and/or Bankert relating to gas turbine modeling by objective functions and control constraints, with the teachings of Chan and/or Reed relating to online dynamic optimization, to realize the elements of the claimed invention. An obvious motivation exists, since in this case, the Hacker and/or Bankert reference teaches to the Chan and/or Reed reference, and the Chan and/or Reed reference teaches to the Hacker and/or Bankert reference. Specifically, both Hacker and/or Bankert and Chan and/or Reed teach optimization of gas turbine design and both are used in the same technological arena as noted above. Hacker and/or Bankert teaches to Chan and/or Reed because Hacker and/or Bankert teaches optimizing a gas turbine design model by objective functions and and control constraints. (See: Hacker and/or Bankert, Abstracts). Chan and/or Reed teaches to Hacker and/or Bankert because Chan and/or Reed specifically teaches optimizing the gas turbine design in and online environment. (See: Chan and/or Reed: Para: 0030/Abstract) Further, the level of skill required by an artisan to realize the claimed

limitations of the present invention is clearly established by both references. (See: Hacker and/or Bankert/Chan and/or Reed, Abstract) Accordingly, a skilled artisan tasked with realizing a method for borehole modeling and predicting failures in a subsurface formation, and having access to the teachings of Hacker and/or Bankert and Chan and/or Reed, would have knowingly modified the teachings of Hacker and/or Bankert with the teachings of Chan and/or Reed (or visa versa) to realize the claimed elements of the present invention.

Per claims 5, 6, and 25: Hacker and/or Bankert teach steady (quiescent) state parameters (Fig. 4, section 4 / CL3-L10-21) while Chan/Reed teach inlet parameters (Tab. 1/Figs. 22-4, Section 4).

Per claims 9, 10, 28, and 29: Hacker and Reed both teach linear and nonlinear modeling (Hacker: Section 3, Reed: Section 4).

Per claims 12-15 and 30-32: Chan and Reed teach online optimization of model parameters and dynamically adjusting objectives and risk assessment (Chan: para:0030, Fig. 5, Reed: Section 3, Figs. 3, 4).

Per claims 16: Hacker and Bankert teach min/max constraint limits (Hacker: Abstract, Section 3, Fig. 4 Bankert: CL3-L31 – CL5-L43, Figs. 1, 2).

4. Claims 2-4, 7, 8, 11, 18, 19, 23, 26, 27, 33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable in further view of US Patent 6,681,1155 issued to Fujita et al.

Per claims 2-4, 11, 23, and 36: Fujita teaches model-based control (MPC) techniques applied to the optimization of a gas turbine model (Summary, Fig. 1, CL3-L7) inclusive of estimating engine constraints (Abstract,CL5-L5-23), optimizing functions, control actions (CL3-L55, Figs. 1, 5).

Per claims 7, 8, 26, 27: Fujita further teaches the use of sensors for measuring various engine parameters both real world and simulated environments (Summary, Figs. 1-3, 5-6).

Per claims 18, 19, and 33: Fujita also teaches separately modeling each turbine engine component (i.e. compressor model, turbine model, etc.) via mathematical expression (Abstract, CL5-L19-67).

Hence, it would have been obvious to one of ordinary skill in the art to further modify the teachings of Hacker and/or Bankert and Chan and/or Reed, with teachings of Fujita using the reasoning previously cited above.

Allowable Subject Matter

5. Claims 17 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In this case the prior art does not disclose the specific sequence to iterative steps relating to the operation of the controller portion of the optimizer controller as recited in claims 17 and 34.

Conclusion

6. ***THIS ACTION IS MADE FINAL.*** *Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).*

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,591,225 issued to Adelman et al teaches optimizing the performance of a gas turbine model using objective functions and constraints.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred Ferris whose telephone number is 571-272-3778 and whose normal working hours are 8:30am to 5:00pm Monday to Friday. Any inquiry of a general nature relating to the status of this application should be directed to the group receptionist whose telephone number is 571-272-3700. If attempts to reach the

examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached at 571-272-2279. The Official Fax Number is: (703) 872-9306

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